

# Low-Cost Brushless DC Motor Rate Sensor

NASA offers companies the opportunity to license or jointly develop this innovative technology for direction-sensitive tachometers and rotational sensors.



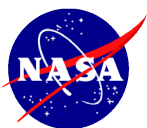
Developed at NASA Marshall Space Flight Center, this new brushless motor technology offers a promising alternative to brush tachometers, resolvers, encoders, and other rotation sensors. This direction-sensitive, reliable, low-cost device is ideal for numerous commercial applications.

## Benefits

- ▶ Long lasting
- ▶ Stand-alone device
- ▶ Extremely reliable
- ▶ Simple design
- ▶ Quiet operation
- ▶ Low cost

## Commercial Applications

- ▶ Antilock brake systems
- ▶ Industrial robotics
- ▶ Medical and other scanning devices
- ▶ Power generators
- ▶ Navigation systems





## The Technology

NASA Marshall Space Flight Center has developed a new brushless DC motor-based rate sensor that addresses the drawbacks associated with other rotation sensor technologies. The mechanical brushes on brush-type tachometers produce electrical arcing and wear out relatively quickly, requiring that the device be replaced. Although prior technology using brushless DC motors/tachometers addresses this issue, most alternatives must be used in conjunction with position sensors and require that wires be added to excite the position sensor. Resolver-developed rate sensors also require wires for an excitation signal. Additionally, they usually require differentiation, which is quite noisy, to produce rate information. Finally, encoder-developed rate sensors' accuracy degrades at low rates because of the discrete nature of encoder outputs.

NASA's technology is a brushless motor-based rate sensor that produces a DC output that is proportional to the rotation rate of a shaft. Windings sense the back electromagnetic force from the shaft, and these windings are coupled with circuits that calculate the DC output. This new device is inherently linear and produces accurate rotation rate signals. The instrument is a stand-alone sensor, requiring neither electrical excitation nor an additional position sensor. Furthermore, this direction-sensitive device has a simple design that requires no mechanical brushes.

## Partnering Opportunities

This brushless DC motor-based rate sensor technology is part of NASA's technology transfer program. The program seeks to stimulate commercial use of NASA-developed technologies. A patent application has been filed for this technology, and development and testing are continuing. NASA invites commercial companies to consider licensing or jointly developing this technology. NASA is flexible in its agreements, and opportunities exist for exclusive, nonexclusive, and exclusive field-of-use licensing.

---

## For More Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:

### **Rhonda Childress-Thompson**

Technology Commercialization Lead  
NASA Marshall Space Flight Center

Phone: (256) 544-4329

Fax: (256) 544-8110

E-mail: [Rhonda.C.Thompson@msfc.nasa.gov](mailto:Rhonda.C.Thompson@msfc.nasa.gov)

More information about working with NASA Marshall's Technology Transfer Department is available online.

***[www.nasasolutions.com](http://www.nasasolutions.com)***